



# Bats, Wind Turbines and Acoustic Deterrents

Hawaiian Hoary Bat Workshop

March 6<sup>th</sup>, 2020

Honolulu, HI

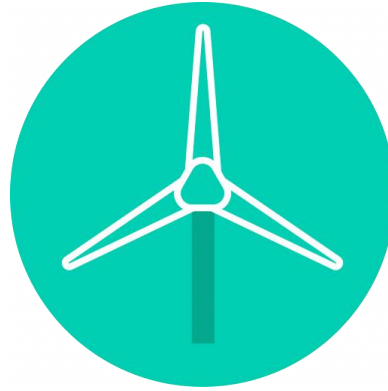
John Ugland [jou@nrgsystems.com]



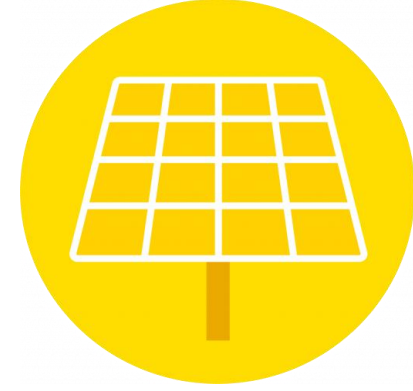
# Who is NRG Systems?



Wind Resource Assessment



Wind Plant Optimization



Solar Monitoring



Solar Resource Assessment



Atmospheric Solutions

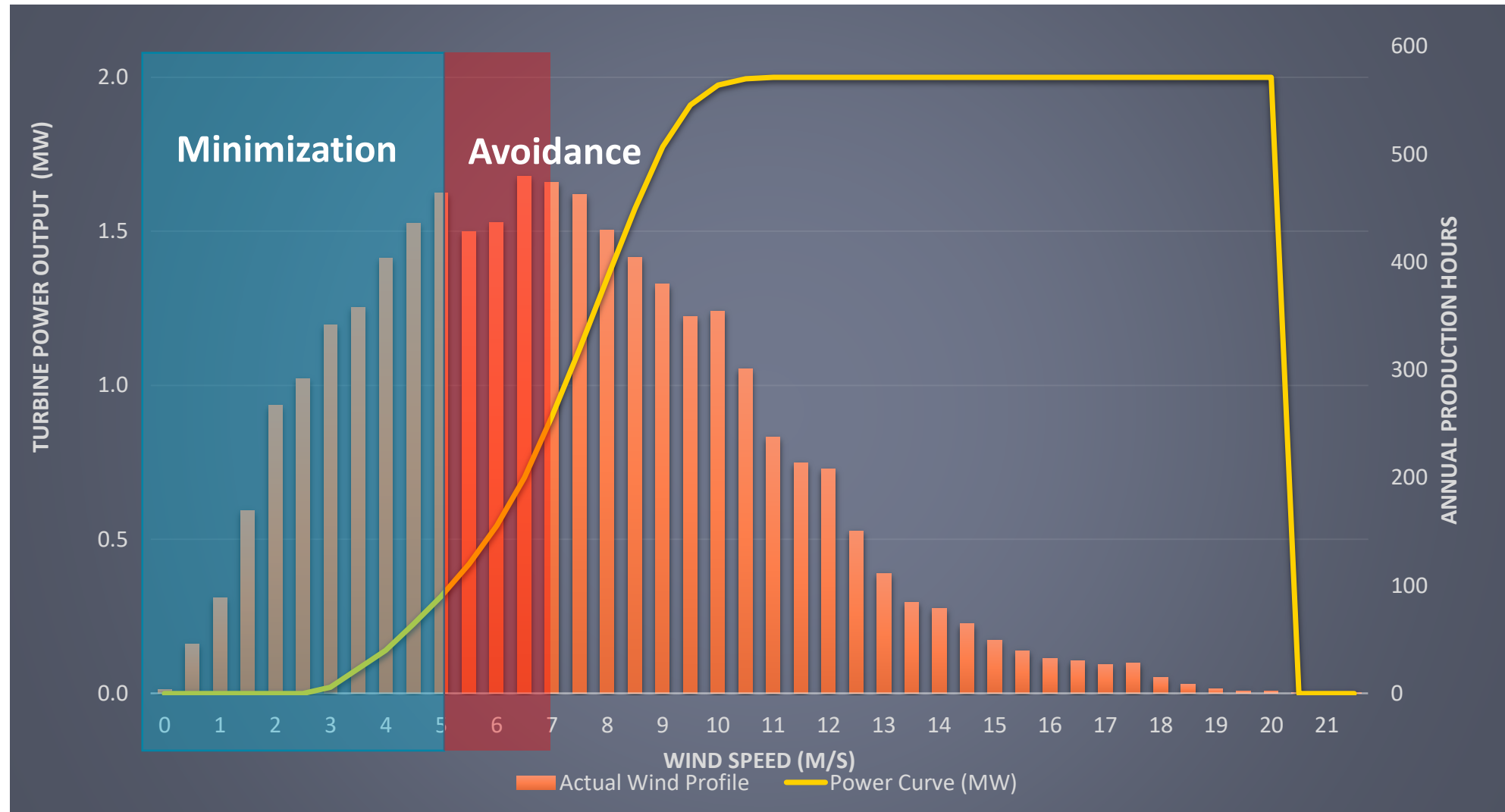


Wildlife

# What is the issue?



# Existing Solution – Curtailment



# Cost of Curtailment

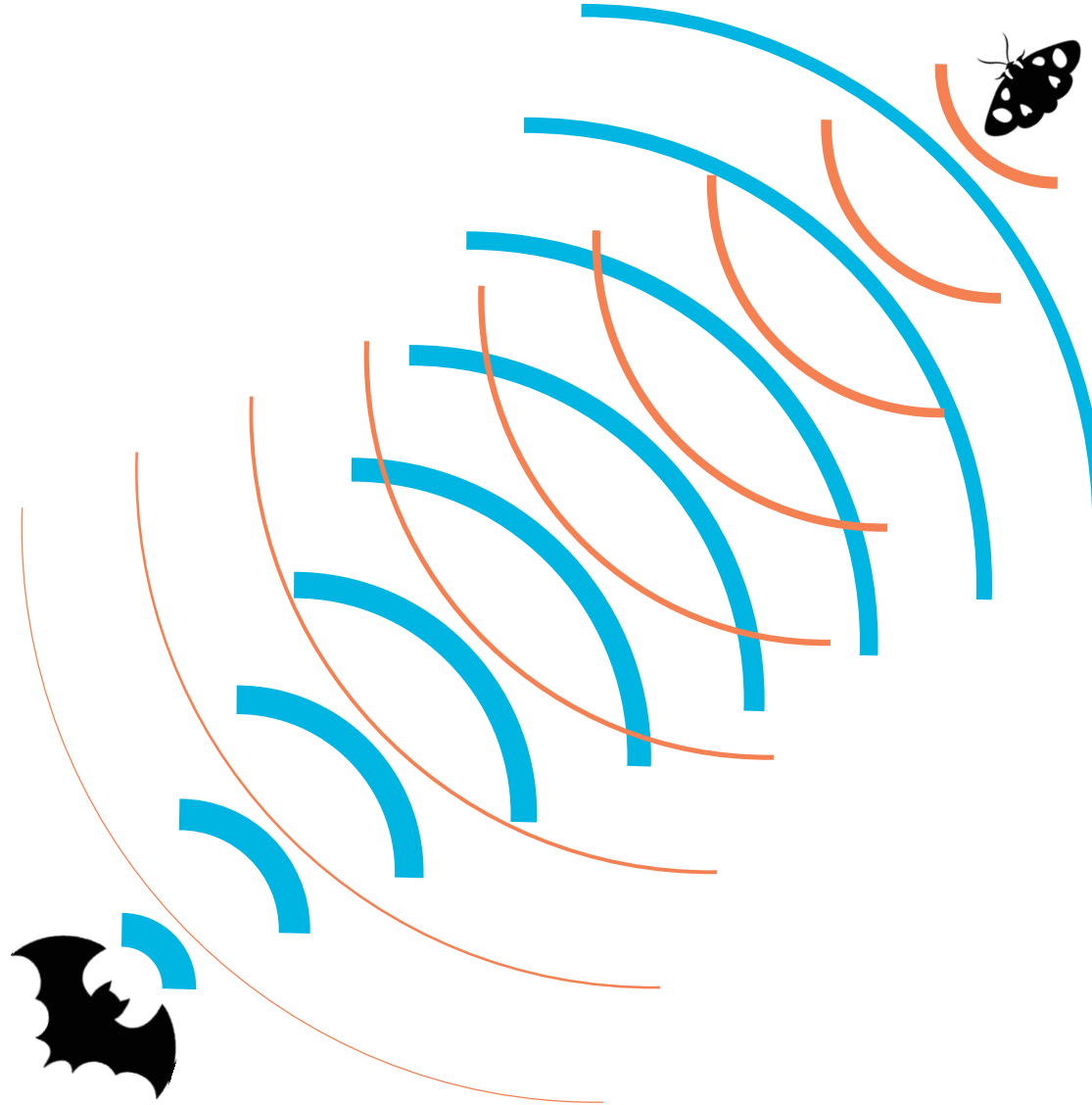


- Minimization is approximately 50% effective
- 0.5% - 3.5% AEP (Annual Energy Production)
- Replacement energy
  - Cost of energy
  - Source of energy (fossil fuels???)

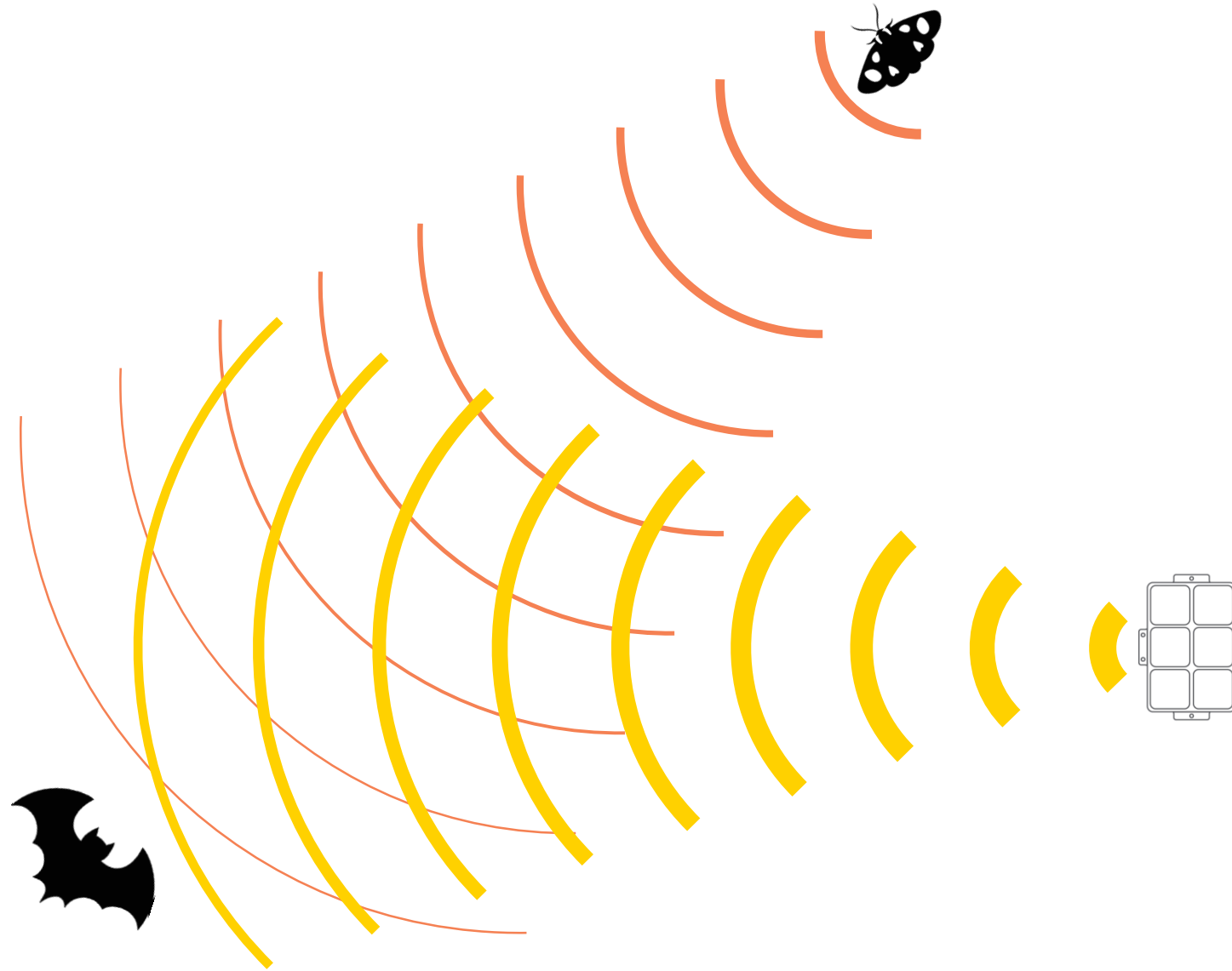


Source: Carl Ostridge & Chris Farmer (2018) "Understanding The Costs of Bat Curtailment." AWEA Wind Project Siting & Environmental Compliance Conference

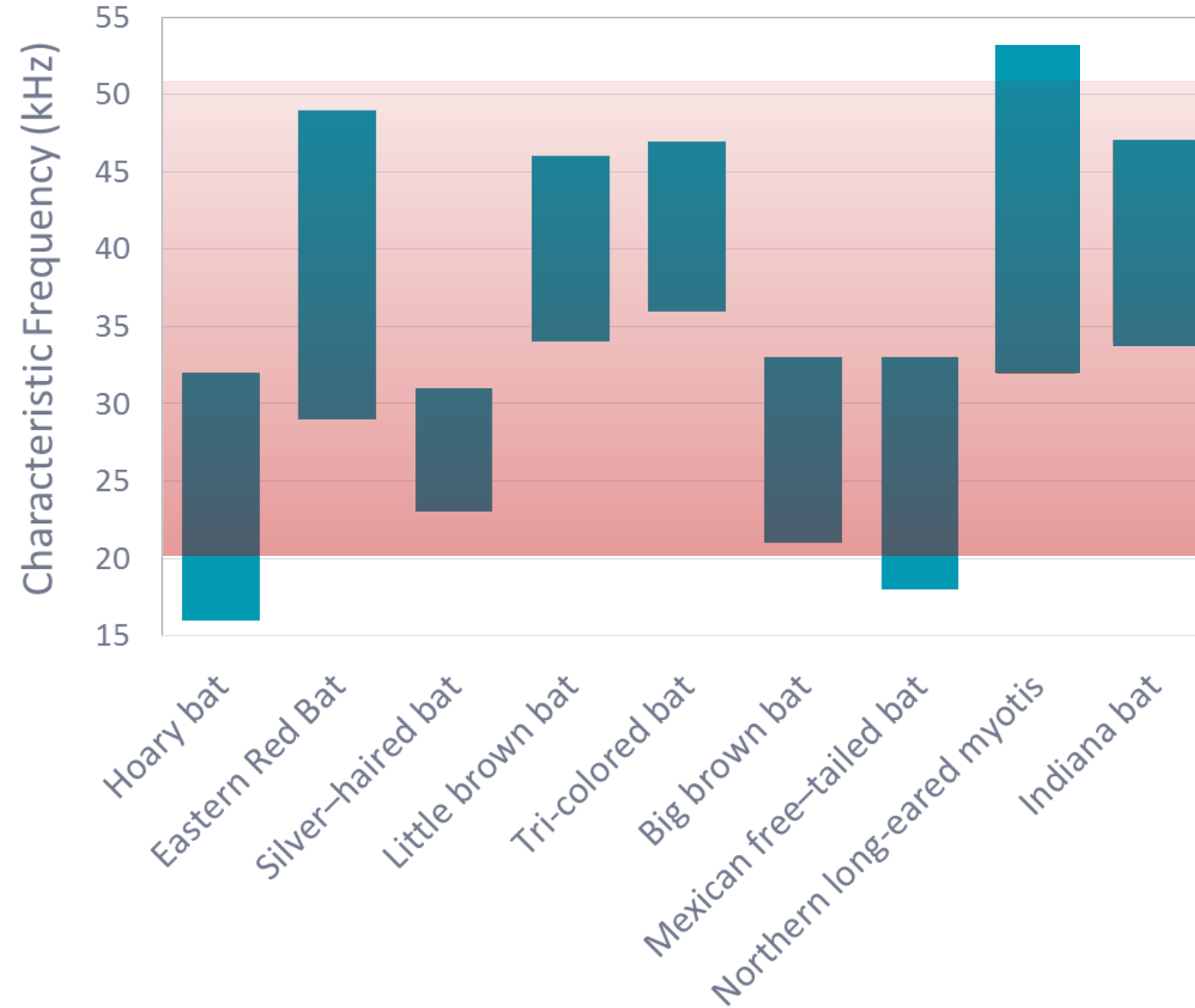
# How does the bat deterrent work?



# How does the bat deterrent work?



# What bats does it work on?

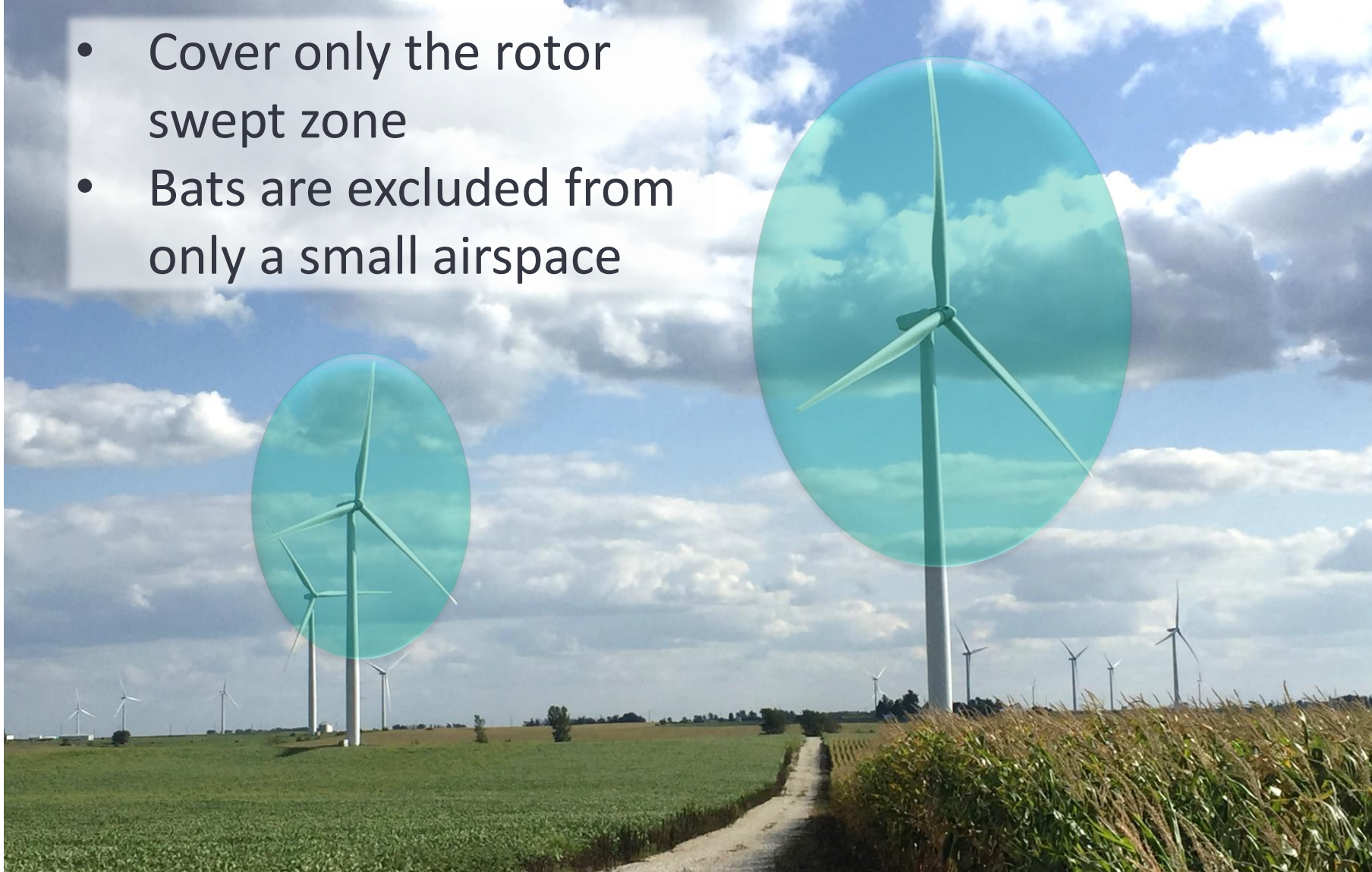




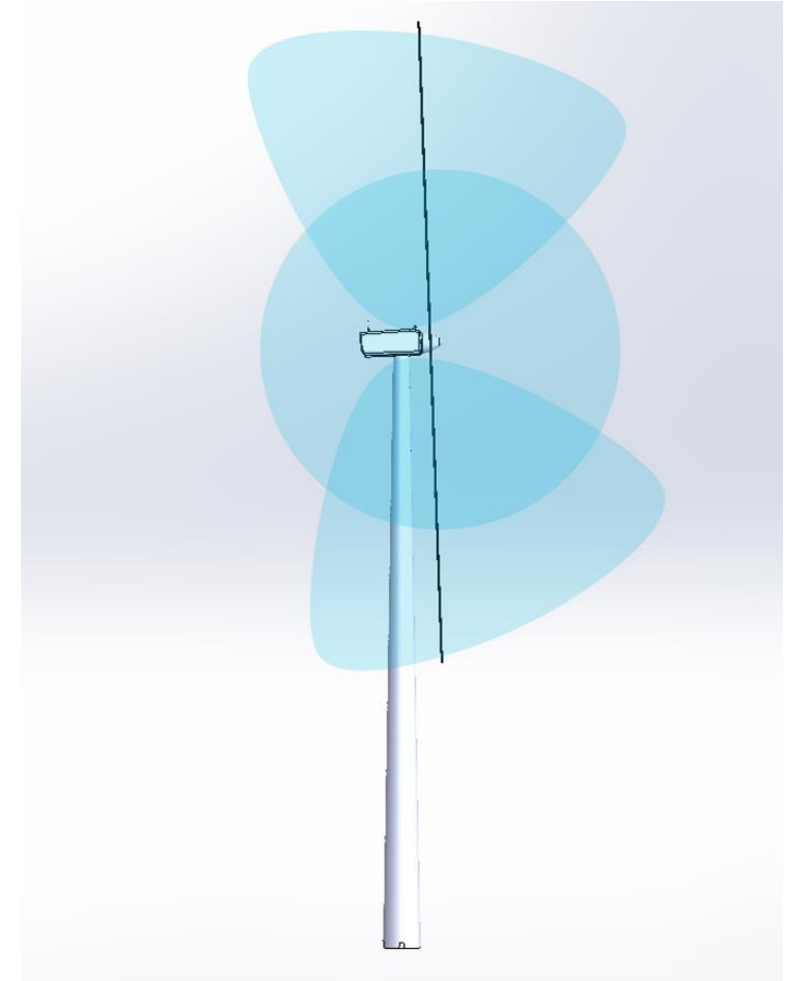
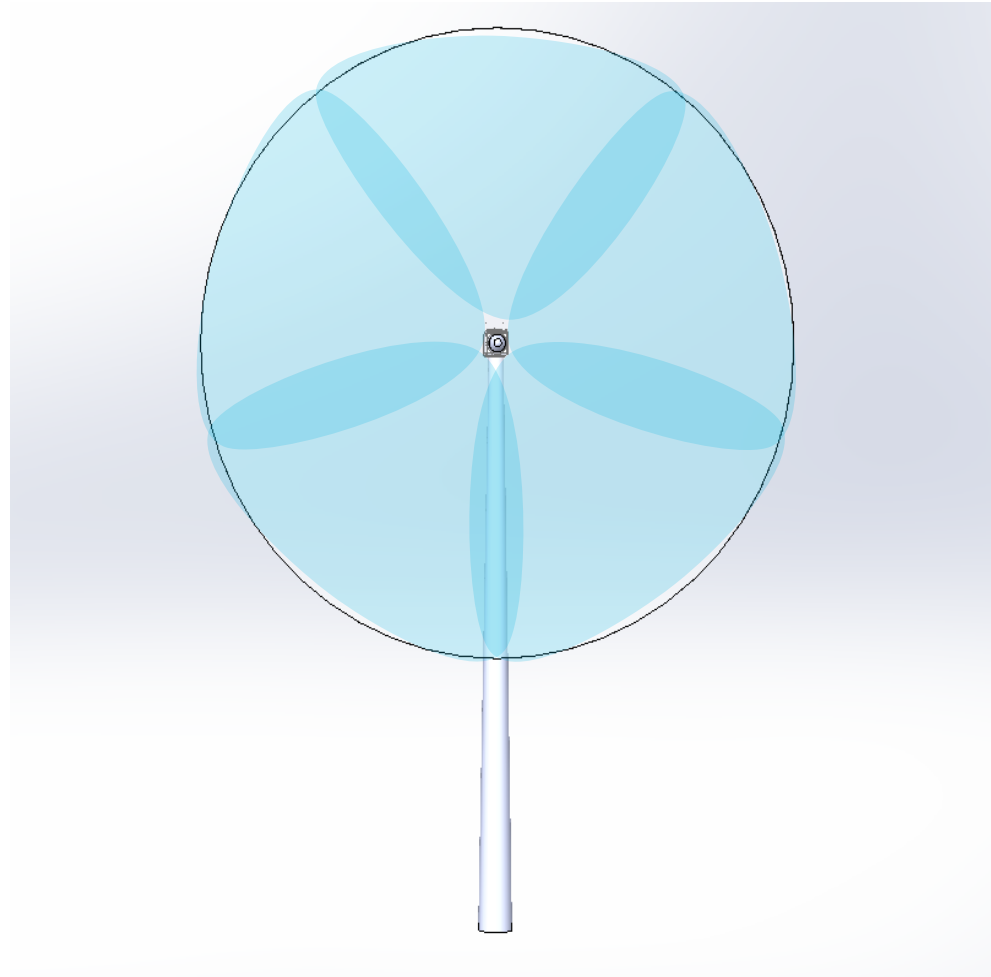
# Where does the ultrasound cover?



- Cover only the rotor swept zone
- Bats are excluded from only a small airspace



# How do you create the ultrasound?



# 2018 Testing Overview

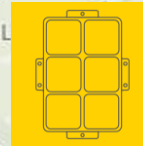
## 16 turbines in Texas

- Random block design
  - Control – feather to cut-in
  - Treatment – 5DU system

5DU



8DU



## 30 turbine in Illinois

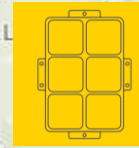
- 15 control –normal operation
- 15 treatment - 8DU system + 5 m/s curtailment



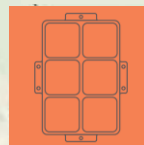
# 2018 Testing Overview

The bat deterrent systems provide significant reductions in bat mortality

Texas Site - 5DU (2017/2018)	Control	Deterrent	% Redux
<b>TOTAL</b>	<b>418</b>	<b>209</b>	<b>50%</b>
Mexican Free-tail (TABR)	334	152	54%
Hoary (LACI)	36	8	78%
Northern Yellow (LAIN)	27	22	19%
Southern Yellow (LAIN)	11	14	-27%
Evening (NYHU)	10	6	40%



8DU



5DU

Illinois - 8DU + 5 m/s	% Redux
<b>TOTAL</b>	<b>68%</b>
Eastern Red (LABO)	57%
Hoary (LACI)	71%
Silver-haired (LANO)	71%
Big Brown (EPFU)	100%

\*based on >500 carcasses recovered

# First full-scale installation in 2019

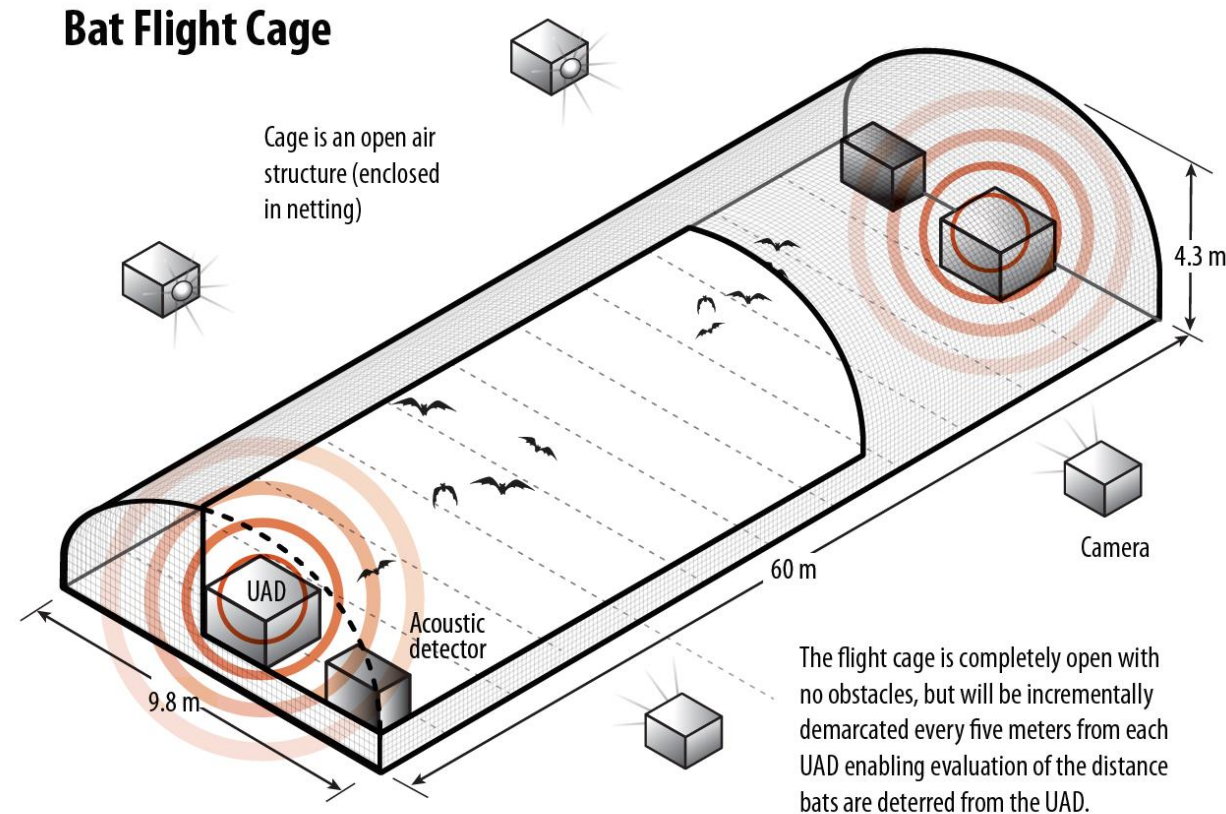


“Kawailoa Wind installed acoustic deterrents at all 30 Project turbines in May and June 2019. Deterrent installation was completed on June 7, 2019. Deterrent functionality is monitored remotely to ensure the systems are functioning properly. To date, no bat fatalities have been observed at turbines with operational bat deterrent systems.” (2019 DLNR Annual Report pg. 23)

# What's next?



- Flight cage testing with Texas State & NREL to understand species specific responses
- Testing on larger rotors (>130m)
- Extension of effective ultrasonic range
- Compatibility with more turbine platforms





# Questions?

